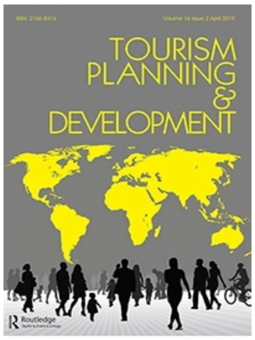

Routledge
Taylor & Francis Group

Tourism Planning & Development

ISSN: 2156-8316 (Print) 2156-8324 (Online) Journal homepage: https://www.tandfonline.com/loi/rthp21

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To cite this article: Carlos A. Romero, Leonardo J. Mastronardi, Juan P. Tarelli & Federico Haslop (2019): The Regional Impact of Tourism when Data is Scarce. An Application to the Province of Salta, Tourism Planning & Development, DOI: 10.1080/21568316.2019.1673808

To link to this article: https://doi.org/10.1080/21568316.2019.1673808

Published online: 16 Oct 2019.

TOURISM PLANNING & DEVELOPMENT
https://doi.org/10.1080/21568316.2019.1673808

The Regional Impact of Tourism when Data is Scarce. An Application to the Province of Salta

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ABSTRACT

Availability of updated and detailed official statistics at subnational level can sometimes be challenging, particularly in the developing world. This kind of data problems can become discouraging to governments trying to understand how their policies impact the economy, life and ecology of small regional areas. We use the case of the province of Salta, in Argentina, to show how, regardless of bad data problems, analysis of policy can be carried on successfully. Based on survey data and location quotients methodology we build a social accounting matrix for Salta. This estimated matrix allows use an input-output analysis to understand the relevance of tourism promotion programmes in the region.

KEYWORDS

Tourism economics; input output analysis; regional economics; regional social accounting matrix

1. Introduction

Part of a properly implemented policy requires the measurement of the potential effects that it may have on several aspects of an economy. These effects are not always straightforward; they can generate indirect impacts that are not always positive and that governments need to be aware of. Input–Output (I-O) models and Computable General Equilibrium (CGE) models are popular tools to understand these problems, and their use in analysis is widespread among governments and several organisations. Their use applied to tourism is also common in regional analysis, such as in Taylor, Hardner, and Stewart (2009), Oosterhaven and Fan (2006), Dwyer, Forsyth, and Spurr (2004), Taylor, Dyer, Stewart, Yunez-Naude, and Ardila (2003), Frechtling and Horvath (1999), and Sinclair (1998).

Although I-O and CGE models can be used both at a national and sub-national level, their implementation at regional level faces a sui-generis problem: unavailability of the data required for their application, in particular, unavailability of either an officially published I–O table or a Social Accounting Matrix (SAM). Behind the construction of these matrices, there is usually a complex process based on the collection of survey-based data from firms and households. Financing these surveys is beyond the budgets of many regional statistical institutes, especially in the developing world, so regional statistics remain obscure. Conducting on regional analysis under these circumstances can be particularly challenging.

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The province of Salta, which lies between the Andes mountains in the North-West of Argentina, faces this issue. It's capital, the City of Salta, was the country's fourth city in terms of overnight stays during 2016 according to a report of the province economy developed by the Ministry of Treasury of Argentina. The construction of new roads and infrastructure, tax modifications, and the promotion of national parks are examples of policies that, if carried out, could alter the inflow of tourists and, therefore, modify Salta's economy and the life of its habitants. Despite the relevance of understanding not only how the connection between tourism and the rest of the economy works but also how policies like the ones mentioned can modify this relationship, the lack of existence of either an I–O table or a SAM can be a problem when seeking a satisfactory analytical answer to these questions.

This issue can be avoided thanks to the development of a family of techniques based on a non-survey methodology. The Location Quotients (LQ) methods can estimate a new I-O table working with relatively easily accessible data, such as regional and national GDP values (Flegg, Webber, & Elliott, 1995; Lahr, 1993). Being an inexpensive alternative to survey methods, while still providing accurate results, this methodology has earned the attention of a growing body of literature, with studies dedicated to improvements of its estimation and to empirical implementations. Among others, LQ techniques have been used in studies for Germany (Kowalewski, 2013), Argentina (Flegg, Mastronardi, & Romero, 2015), and Greece (Kolokontes, Karafillis, & Chatzitheodoridis, 2008).

Sometimes, financing a survey big enough to contemplate an entire region is not viable, but it may be possible to develop smaller-scale surveys that focus on, for example, particular industries central to the research objective. If this is the case, hybrid (or semi-survey) techniques allow the researcher to improve LQ estimations by combining them with survey-based data. This is accomplished by using techniques such as either RAS or Cross-Entropy. Hybrid techniques have attracted the attention of many researchers and gained their share of participation in the literature of I-O analysis, with examples such as Surugiu and Surugiu (2015) and Taylor et al. (2009).

The objective of this study is to show how hybrid techniques can be a helpful tool when regional studies face problems related to either poor or inexistent data. To this end, we use the case of the province of Salta, which we have introduced already. We create an estimated SAM with a hybrid approach, relying on the Flegg Location Quotient (Flegg & Webber, 1997; Flegg et al., 1995) technique and data obtained from tourism industry firms and households surveys. The resulting SAM is implemented in an interregional I–O model analysis to understand the regional impact of tourism promotion policies in Salta. Finally, we also present an example of how these techniques can allow governments to use cost–benefit analysis to evaluate the impact of policies.

This document is organised in the following way: section 2 presents a brief explanation of the tourism activity in Salta. Section 3 explains the data and simulations used. Section 4 presents the results of the estimated models. Section 5 explains the social cost–benefit analysis of a tourism programme. Finally, section 6 presents the conclusions of the document.

2. A brief introduction to tourism in Salta

The province of Salta is located along the central Andes in north-western Argentina and shares borders with Chile, Bolivia, and Paraguay, as well as six other Argentinian provinces.[1] Salta is a large province, with an area similar to either Nepal or Greece (155,488 square km) and a diverse geography that ranges from arid valleys to jungles. This natural diversity, together with a rich history, provides the province with a range of touristic attractions and experiences that position it as a top destination in the country for both national and overseas visitors. The capital city of the province attracts tourists with its colonial architecture, and it is commonly-used as a base point for visiting the rest of the region's attractions, like the towns of Cachi and Cafayate. The province of Salta also contains several protected areas, including three national parks that encompass its geographical diversity.

According to the provisional statistics of the World Tourism Organisation, Argentina was the most visited country in South America in 2017, with approximately 6.7 million international arrivals. This performance allowed the tourism sector to represent 30% of service exports (being the second biggest services exporter of the country) and 5.4% of total exports. The Domestic Tourism Survey of the Ministry of Tourism of Argentina shows that, in terms of domestic tourism, the industry generated 8.5 billion dollars in 2016. Taking an average of the total visits (domestic and international) throughout the country, between 2012 and 2014, 3.6% were hosted by Salta, making the province recipient of 3.9% of the total tourist spending.

Salta's importance as a tourism destination is particularly clear at regional level, accounting for 33.2% (4.3 million visits) of the total tourist spending in the northern provinces of Argentina.[2]

The INDEC conducts a permanent survey across the whole country; in respect of hotel and tourism statistics, the survey contains interesting insights on the evolution of this industry across time. A resume of its contents is shown in the remainder of this section.

Figure 1 shows the evolution of tourists (domestic and international) that have visited the City of Salta between 2008 and 2016. As stated before, the City of Salta is usually used as a base point for visiting the rest of the region, so understanding the behaviour of its

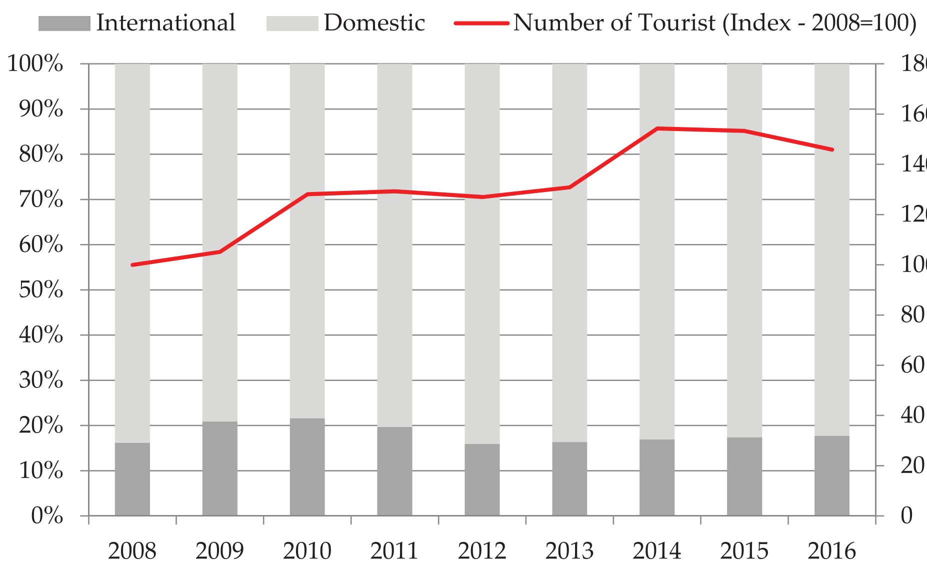

Figure 1. Quantity of international and domestic tourists that visited the City of Salta, 2008-2016. Source: Hotel Occupancy Survey. National Institute of Statistics and Census from Argentina.

tourism industry can help in understanding the bigger picture. Tourism in the city of Salta seems to have undergone dynamic growth, with a 46% increase of visitors from 2008 to 2016. The visitor composition is steady between national and overseas visitors: an average of 22% of international tourists visited during the analysed period.

These figures are in line with what has happened across the northern provinces of the country.[3] In this region, including the province of Salta, there was a 27% increase in visitors between 2008 and 2016. In the case of the City of Salta, the composition of tourism is steady in this period, with international visitors representing approximately 13% of the total tourists.

Statistics of visitor quantities are also available nationwide, but for a shorter period. Between 2011 and 2016, the total number of tourists increased by almost 6%. This contrasts interestingly with the reality of the tourism sector of the northern provinces and the City of Salta, where the registered growth for the same period was 10% and 13%, respectively.

The growth of the tourism industry in the northern region of Argentina can also be seen in supply numbers: According to the Hotel Occupancy Survey the quantity of hotels has grown by 64% between 2008 and 2016, and the number of available rooms has risen by 36%. Apart from the increase in visitors, an expansion in infrastructure can also be seen, with growth in the number of hotels and available rooms.

Even if the changes that Salta's tourism industry has undergone during recent years may not have had a big impact on the national economy because of the province's relatively small size, they could have relevant regional importance. The growth of the sector could be significant enough to re-shape the way in which Salta's economy generates income, products, and employment. Therein lies the relevance of understanding its nature.

3. Data and models

3.1. The construction of the SAM

When it comes to regional analysis, Argentina, as do many other countries, faces an obstacle: poor data. In an ideal situation, we would like to have access to either officially-developed social accounting matrices or I–O tables; however, these are hard to find when it comes to sub-national regions. Nevertheless, regional and national statistical departments usually offer a set of different variables and datasets that can help us construct our own SAMs. These variables and datasets include regional gross domestic product values, government budgets, consumer and firm's surveys, taxation information, and regional exports/imports.

By combining secondary data with survey results, hybrid techniques can be used to estimate an I–O table and a regional SAM for the province of Salta. In Table 1, we present a resume of the information contained in the estimated SAM, in particular, the GDP shares of every sector and the participation of labour and capital per industry. Throughout this document, when we refer to "touristic sectors" we will be talking about hotels, restaurants, passenger transport, and other touristic services, such as entertainment.

The total tourism spending, which represents approximately 8% of Salta's GDP, is composed of two elements: the money spent by domestic visitors and the money spent by visitors from the rest of the world. Even though we use the term "touristic sectors" to refer to hotels, restaurants, passenger transport, touristic agencies and other related services in this document, the budget of tourists is distributed over a broader category of goods. Table 2 shows how domestic and international tourists spend their money across the different good and

Table 1. Descriptive variables taken from the estimated Social Accounting Matrix of Salta.

Sectors	GDP Shares	Share Labor	Share Capital
Primary	19.0%	22.8%	77.2%
Food and beverages	4.7%	38.5%	61.5%
Textile and leather	1.0%	35.8%	64.2%
Refinery	4.7%	3.9%	96.1%
Chemicals and plastics	1.4%	12.1%	87.9%
Rest of the industry	0.8%	30.4%	69.6%
Electricity, gas and water	2.7%	13.8%	86.2%
Construction	4.4%	39.4%	60.6%
Commerce	10.7%	20.2%	79.8%
Hotels	0.8%	40.9%	59.1%
Restaurants	0.8%	36.9%	63.1%
Land transport	5.2%	18.3%	81.7%
Airlines & tourism agencies	1.1%	16.0%	84.0%
Others (transport)	0.4%	18.3%	81.7%
Others (tourist services)	0.1%	34.5%	65.5%
Public sector and others	42.2%	56.7%	43.3%
Total	31,863	-	-

GDP Values expressed in percentage and millions of Argentinian Pesos (at basic prices of 2014).
Source: Author's estimations and Statistics Department of the Province of Salta. Note: The total GDP is equivalent to 3,924 million US dollars.

Table 2. Composition of tourism spending.

Sectors	Domestic Tourism	International Tourism
Primary	0.0%	0.0%
Food and beverages	6.1%	3.2%
Textile and leather	2.0%	5.0%
Refinery	8.3%	1.9%
Chemicals and plastics	0.0%	0.0%
Rest of the industry	0.0%	0.0%
Electricity, gas and water	0.0%	0.0%
Construction	0.0%	0.0%
Commerce	12.9%	3.6%
Hotels	15.2%	13.9%
Restaurants	14.0%	28.7%
Land transport	10.2%	6.4%
Airlines & tourism agencies	23.7%	30.4%
Others (transport)	0.0%	0.0%
Others (tourist services)	0.1%	0.1%
Public sector and others	7.5%	6.8%
Total	$4,474	$1,210

Source: Author's estimations.

services' categories. At benchmark values, the expenditure of tourists in Salta was calculated in $5,684 million of Argentine Pesos (i.e. 700 million US Dollars). Of that amount, 79% came from Argentinian tourists, and 21% came from visitors from the rest of the world.

For the sake of clarity, we divide the construction of the SAM into subsections: first, we introduce the use of the FLQ technique to obtain an estimated I-O table, then we present the application of hybrid techniques for improving the first estimation with survey data, and, finally, we describe the construction of the regional social accounting matrix.

3.2. Applying FLQ techniques

As mentioned above, location quotients techniques are an affordable and effective way of obtaining input-output tables when survey-based techniques are not available. Their advantages have promoted a growing literature that has been working on improving its estimations and testing them on an empirical basis. Even if different LQ estimator coexist in the literature, their essence is similar. On one hand, they work under the assumption that regional technologies are equal to the average national ones. On the other hand, they assume what's stablished in equation 1, which means that interregional coefficients (a_{ij}^{R}) differ from the national technical coefficient (a_{ij}^{M}) by a participation factor in the regional commerce (lq_{ij})

$$a_{ij}^{R} = lq_{ij}\; a_{ij}^{N} \tag{1}$$

where sub-indexes *i* and *j* reffer to the selling and buying sectors respectively, meaning that a_{ij}^{R} (also known as "regional input coefficient") shows the quantity of input *i* that is required for producing a unit of product *j*. Superscripts *R* and *N* refer to region and nation respectively.

The Flegg Location Quotient (FLQ) offers a variation of the LQ estimation by taking into consideration the relative size of the region (Flegg et al., 1995; Flegg & Webber, 1997). The FLQ proposes an inverse relationship between the size of the region and the propensity to import from the rest of the regions. Several studies in the literature show that the FLQ outperforms other LQ approaches such as the SLQ and CILQ. The usage of Monte Carlo simulation has shown evidence favouring the FLQ technique over its counterparts (Bonfiglio & Chelli, 2008) and other studies applying data from Scotland (Flegg & Webber, 2000), Germany (Kowalewski, 2013) and Finland (Tohmo, 2004) have found similar results. In Argentina, Flegg et al. (2015) tests these methods for Cordoba Province.[4] The calculation of the coefficient is introduced in equations 2 and 3.

$$FLQ_{ij} = \frac{\dfrac{GDP_{i,R}}{GDP_{i,N}}}{\dfrac{GDP_{j,R}}{GDP_{j,N}}} \times \lambda^{*} = CILQ_{ij} \times \lambda^{*} \tag{2}$$

$$\lambda^{*} = \left[log_{2}\left(1 + \frac{GDP_{R}}{GDP_{N}}\right)\right]^{\delta}, 0 \leq \delta \leq 1 \tag{3}$$

where *GDP* represents the Gross Domestic Product, sub-indexes *i* and *j* industries and superscripts *R* and *N* regions.

The application of the FLQ requires two databases: The industry-disaggregated GDP levels of the region and the national GDP levels. As the data must be compatible to be able to work on them, they must be updated to the same year and contemplate the same industry aggregation. In the case of Salta, even if our data are matched in temporal terms, the aggregation of industries is not the same, so we applied ourselves to compatibilising both databases. Finally, an I–O table containing inter and intra-regional information for Salta and the rest of the country was obtained.

3.3. Improving the estimation with hybrid techniques

As mentioned before, several studies have provided evidence on the accuracy of the FLQ technique. Nevertheless, the final estimations of the I–O table can be improved if reinforced with survey data. As explained in Miller and Blair (2009), hybrid techniques allow the analyst to include information coming from either small or focused surveys in the estimations obtained from non-survey techniques. The resulting product is a mix of survey and non-survey information, and, hence, is hybrid in nature.

Various hybrid techniques facilitate performance of this task, but the most popular are the RAS and the Cross Entropy methods. RAS, also known as Bi-proportional Matrix Balancing, is an iterative process that, given the total values of rows and columns, can perform a re-adjustment of a matrix (Stone, 1977). The Cross-Entropy method is an optimising technique that minimises a distance measure between an initial matrix and different calculated matrices conditioned to a set of constraints, both technological and transactional.

The Cross-Entropy method is the more flexible of the two, as it allows for the inclusion of restrictions on regional technical coefficients to enable its estimations to be performed with either the same or a lesser amount of information than would be needed if applying RAS (with the accuracy of the result depending on the available secondary information). The methods should not be seen as opposing each other, as it has been shown that RAS is a particular case of Cross-Entropy (McDougall, 1999). In this study, both methods have been applied.

For the case of Salta, we had access to a set of three different surveys that were designed and implemented under an impact-evaluation project done in the region for studying tourism policies. These surveys included three groups: households, firms related to the tourism industry, and tourists. These data allow us to improve the results of our estimations, particularly for those industries related to tourism, thus supporting better answers to the questions raised by this study.

Some of the most important data collected were the data regarding tourism-industry firms. The survey considered tourism agencies, campsites, hotels, museums, restaurants, transport firms, and casinos, with restaurants and hotels representing almost 80% of the total observations. In total, the survey included observations for 397 touristic companies and organisations.

Several questions that were asked of the surveyed firms allowed us to obtain useful information regarding costs, output, labour, tax payments, and profit. The questions in relation to inputs and outputs were particularly detailed, which helped us to obtain the cost structures of these firms. The data accessed also informed us if sales were used as either intermediate or final consumption and allowed us to examine whether the inputs were bought from other firms in the region, the rest of the country, or overseas, in addition to the geographical destinations of the products that were sold.

The household survey was collected in different areas of the province of Salta and encompassed a total of 1,420 observations. A set of diverse data was obtained from each individual surveyed; these data included quantitative and qualitative characteristics of consumption and sources of income. Information about tax payments and money transfers was also available. The survey was detailed in its questions, revealing whether a certain family member works in the private or the public sector, the type of industry in which she or he is employed, and the amount of their income in terms of either salary or share in revenues. A similar degree of detail was involved in the consumption questions, enabling us to know the amount of money spent on goods and services with a minimum level of aggregation in their categories.

The tourists' survey focused on tourists visiting different areas of the province and asked several questions regarding not only the origins of these visitors but also their plans while in the area, the type of accommodation in which they were staying, and the goods and services consumed. The information provided by this survey played a useful role in constructing the cost structures of those sectors related to the tourism industry of Salta. The survey included information from 910 observations.

3.4. Concluding the construction of the SAM

The objective of a SAM is to capture all the different transactions that occur in an economy during an established time frame, creating a detailed picture of it. A SAM will describe the transactions occurring in the production and resources' markets (Miller & Blair, 2009) while considering and accounting for interaction between government, firms, households, and the rest of the world. Social Accounting Matrices are related closely to the structure that can be found in national accounts databases, representing an overall balance between the income and outflows of each of the participants in the economy. Moreover, SAMs can be thought of as a way of representing national accounts' data in an expanded and more detailed way. These matrices can also be approached as an extension to I–O tables, including not only information on transactions between industries but also a more detailed view of final consumption and value added.

Reading and interpreting a SAM can be a simple and intuitive process once its organisation is understood. As their name indicates, SAMs are matrices in which rows and columns represent markets and institutions and the elements represent the transactions that happen between them. As a general rule, rows represent incomes and columns represent outflows. Table 3 presents a Macro-SAM (i.e. a SAM for which markets and institutions are aggregated) with the goal of providing a clearer understanding of the concepts introduced. To foster familiarity with the SAM-logic, take as an example the point where the row "Government" intercepts the column "Households"; at that point, "direct taxes" will represent an income for the government and an outflow for the households.

The estimated I–O table is an important element of the SAM, but other data sources were still needed complete its construction. Note that I-O tables contain information on final consumption in an aggregated way, so secondary data sources are necessary to distinguish the shares belonging to government, households, and exports. Different sources of information were used to accomplish this separation: household surveys provided us with data on household consumption, government spending was obtained from government budgets, and regional exports' databases published by the INDEC contained the data for firm's exports to overseas destinations.

The value of exports (imports) that firms in Salta sold (bought) to/from the rest of the country was obtained from the estimation of the I–O table and from survey results. Imports by Salta's firms from international providers were calculated based on the imports' technical coefficients of Argentina under the assumption that the technologies regarding the international imports of Salta were equal to those of Argentina.

The data regarding added value were constructed by adding the information provided by the household survey to the estimated I–O table. Information on government expenses, transfers, and tax payments was obtained from government budgets, tax agencies' databases, and surveys of household and firms.

Investment data were scattered along different sources. Public investment can be deducted from the information provided by government budgets, but there is no single source of data regarding private investment. This last information was constructed by using data from the construction sector GDP, results of the FLQ estimation (in terms of capital goods' demand) and firm surveys. This information was then combined with data on savings reported in the household survey.

Table 3. Simplified Macro-SAM.

	Activities	Commodities	Factors	Households	Government	Investment	ROW	Total
Activities		Domestic offer						Production
Commodities	Intermediate demand			Private consumption	Public consumption	Investment	Exports	Total Demand
Factors	Value added						ROW factors payments	Factors income
Households			Factor payments		Government transfers		ROW transfers	Households income
Government		Indirect taxes		Direct taxes			ROW transfers	Government Income
Investment				Private saving	Fiscal result		Current Account	Total savings
ROW		Imports						ROW income
Total	Production	Total offer	Total factor payments	Households Income	Government Income	Investment spending	Income from ROW	

Source: Author's own elaboration.

3.5. The I-O model

I–O tables and SAMs are a primary element of I–O and CGE models, a set of analytical techniques that have gained popularity in the last two decades. I–O models offer relatively simpler and more intuitive mechanics than do CGE models, though at the cost of relying on heavier assumptions. CGE models provide the analyst with more comprehensive and accurate results, considering the limit to the usage of resources and the effects of price changes, but at the cost of larger data needs and analytic complexity. Which model fits best the analyst preferences will depend primarily on the scope of her objective: the literature on tourism analysis offers several examples on the empirical application of both options. In the case of the present study, we present the application of our estimated SAM with an I–O model, but it could easily be adopted for its usage under a CGE approach.

Next, we present the mechanics behind an interregional I-O model under the notation of Miller and Blair (2009). Let us begin with the following matrix,

$$Z = \begin{bmatrix} Z^{RR} & Z^{RN} \\ Z^{NR} & Z^{NN} \end{bmatrix} \tag{4}$$

Where both Z^{RR} and Z^{NN} represent transaction matrices among firms within a unique region. That is, matrices that resume the information of transactions among firms that belong to region R and the information of transactions among firms that belong to region N. We can think of region R as our region of interest and of region N as the rest of the country. Matrix Z^{RN} considers information on interregional commerce, particularly about sales of region R's firms to firms located in region N. Matrix Z^{NR} computes the interregional commerce in the opposite direction.

Taking this notation, we can stablish an equation that can discriminate how total sales of a particular sector of a particular region are distributed among buyers:

$$x_i^R = z_{ij}^{RR} + z_{ij}^{RN} + f_i^R \tag{5}$$

Where x_i^R represents total sales of firms of sector I of region R; z_{ij}^{RR} and z_{ij}^{RN} represent total sales of sector i′s firms to sector j′s firms of regions R and N, respectively; and f_i^R represents total sales of firms of sector *i* of region R dedicated to final consumption both inside and outside region R.

If we take the ratio among the components of matrix (1) and equation (5) we can obtain the set of technical coefficients for both intraregional (a_{ij}^{RR}, a_{ij}^{NN}) and interregional commerce (a_{ij}^{RN}, a_{ij}^{NR}).

$$a_{ij}^{RR} = \frac{z_{ij}^{RR}}{x_j^R},\ a_{ij}^{NN} = \frac{z_{ij}^{NN}}{x_j^N},\ a_{ij}^{RN} = \frac{z_{ij}^{RN}}{x_j^N},\ a_{ij}^{NR} = \frac{z_{ij}^{NR}}{x_j^R}$$

These technical coefficients represent the quotient among purchases of sector *j* from sector *i* and the total production value of sector *j* for each region. Using these coefficients, we can express equation (5) as,

$$x_i^R = a_{ij}^{RR}\, x_j^R + a_{ij}^{RS}\, x_j^S + f_i^R \tag{6}$$

And, using equation (6), we can present two equations that provide information about commercial interactions generated within and among regions:

$$(I - A^{RR})x^R - A^{RN}x^N = f^R \tag{7}$$

$$-A^{NR}x^R + (I - A^{NN})x^N = f^N \tag{8}$$

Where submatrices A are,

$$A^{RR} = \begin{bmatrix} a_{11}^{RR} & \cdots & a_{1j}^{RR} \\ \vdots & \ddots & \vdots \\ a_{i1}^{RR} & \cdots & a_{ij}^{RR} \end{bmatrix}, \quad A^{RN} = \begin{bmatrix} a_{11}^{RN} & \cdots & a_{1j}^{RN} \\ \vdots & \ddots & \vdots \\ a_{i1}^{RN} & \cdots & a_{ij}^{RN} \end{bmatrix},$$

Given the expressions introduced, we can now represent intraregional and interregional commerce of regions R and N under a single equation:

$$(I - A)x = f \tag{9}$$

With the matrices that compose it being,

$$A = [A^{RR}\ A^{RN}\ A^{NR}\ A^{NN}], \quad x = [x^R\ x^N], \quad f = [f^R\ f^N], \quad I = [I\ 0\ 0\ I]$$

To understand how the model can capture the variations generated by external shocks to the economy, we can think of the variables x^R, x^N, f^R y f^N of equations (7) and (8) not as absolute values but as variations: Δx^R, Δx^N, Δf^R y Δf^B, For simplifying the present example we are going to assume that $\Delta f^N = 0$. Under these assumptions we can solve equation (8) for x^N:

$$x^N = (I - A^{NN})^{-1}A^{NR}x^R$$

And replacing in equation (8):

$$(I - A^{RR})x^R - A^{RN}(I - A^{NN})^{-1}A^{NR}x^R = f^R \tag{10}$$

Notice that if equation (10) made reference to a model of a single region, it would equal the equation (9)

$$(I - A^{RR})x^R = f^R$$

Which implies that the second term of equation (10),

$$A^{RN}(I - A^{NN})^{-1}A^{NR}x^R$$

Introduces the interregional dynamics of the model. On one hand $A^{NR}x^R$ represents purchases that region R makes from region N to sustain its production growth. On the other hand, $A^{RN}(I - A^{NN})^{-1}$ represents the direct and indirect effects that the growth in demand will have for region N.

4. Simulations and results

4.1. Simulation strategy

Different strategies are used in the literature for understanding the tourism industry under either a general equilibrium or an I–O approach. Sometimes, the nature of the question that dominates the study shapes the simulation strategy. For example, in Allan, Lecca, and Swales (2017) in order to understand how the announcement of the organisation of the Commonwealth Games in Glasgow (as well as the games themselves) modified the economy, it was required to simulate forward looking agents. Another example can be found in Becken and Lennox (2012), where understanding the implications of oil price changes in tourism shapes a particular simulation strategy, with attention paid to oil production.

As opposed to studies in which questions rest on the occurrence of a particular phenomenon, be it either real or hypothetical, our study does not have a clear ground on which to base its simulation strategy. In other words, even if we intend to understand how the tourism industry in Salta could be transforming its economy, we are not interested in understanding how this is affected by a particular shock.

These conditions give the simulation strategy flexibility, as it does not have to respond to particular simulation requirements, but, at the same time, it makes the induced shocks arbitrary. We decided to simulate a 10% increase in tourism demand to see how changes in this industry can modify the state of the rest of the economy. In real life, this could be motivated by different reasons, such as either campaigns promoting areas of touristic interest or airport improvements that allow an increase in the amount of arrivals.

The increase in tourism demand is modelled by increasing the total number of visitors while keeping the previous per-capita tourism spending constant. Said tourism demand is be divided into two components: domestic and international tourism. The simulations presented will test the results to sensibility in terms of capital mobility and type of tourism (national or international).

The results that can be obtained from this type of technique do not only give answers to questions regarding the responses of certain variables of interests but can also work as a useful input for other applications. One of those applications is cost–benefit analysis. If we think of the shock as a result of a particular policy, we can compare the benefits that the said policy generated under the simulation conditions with the financial costs of its implementation to obtain a conclusion about its potential net benefit. For more information regarding the implementation of cost–benefit analysis in CGE environments, refer to Taylor (2010). Along with the main results, we present a simple example of their use for cost–benefit analysis.

4.2. I–O model results

The results that are obtained from an I–O model are not as comprehensive as are those provided by a CGE model, but their understanding is intuitive and straightforward. All the variations that an exogenous change can generate under a simulation are captured by the I–O multipliers. These multipliers register variations of different aspects of the simulated economy, from production and value added, to industry specific and regional indicators. A set of 4 models were simulated:

- Model 1: Open I–O Model.
- Model 2: Closed model, including Salta households.
- Model 3: Closed model, including households from Argentina.
- Model 4: SAM-Based model, including households and activities from Argentina.

Table 4. Input-Output Models results for models 1–4 (Millions of $ of 2014).

	Model 1		Model 2		Model 3		Model 4	
Effect	$	Var. %	$	Var. %	$	Var. %	$	Var. %
Direct	568.0	0.9%	568.0	0.9%	568.0	0.9%	568.0	0.9%
Indirect	175.9	0.3%	634.2	1.0%	944.3	1.5%	2970.9	4.6%
Total	744.0	1.2%	1202.3	1.9%	1512.3	2.3%	3539.0	5.5%
Impact on Salta activity sectors								
Primary	12.6	0.1%	12.7	0.1%	12.7	0.1%	13.0	0.1%
Industry	49.2	0.3%	49.4	0.3%	49.5	0.3%	49.9	0.4%
Tourist Sect.	318.5	3.6%	318.5	3.6%	318.7	3.6%	319.2	3.6%
Services	129.7	0.4%	130.0	0.4%	130.1	0.4%	130.9	0.4%
Total effect on Salta	510.0	0.8%	510.7	0.8%	511.0	0.8%	513.0	0.8%

Source: Author's estimates.[7] Note: The variations are calculated with respect to the production values.

Table 5. Input-Output tourism multipliers for models 1–4.

	Model 1	Model 2	Model 3	Model 4
Tourism Multiplier Salta	0.898	0.943	0.944	0.958
Only domestic	0.874	0.921	0.922	0.936
Only Foreign	0.984	1.025	1.026	1.040
Tourism Multiplier Total	1.310	2.117	2.662	6.230

Source: Author's estimates.

We simulated a change in tourism spending of 10% (from both national and overseas visitors), the results of which are shown in Table 4. When comparing the results of the different models, it can be seen that, independent of the addition of new households and sectors, the total effect on Salta remains almost constant. This could indicate that space for improvement exists in the productivity connectivity of Salta.

The tourism multiplier represents the increase in production generated by each dollar spent by tourists. The multiplier values for each model are presented in Table 5. The results show an interesting occurrence: after an increase in tourism consumption, the benefit for Salta is smaller than is the observed direct effect. Take as an example the results for model 4, where the multiplier states that, for each dollar spent in tourism, 0.958 $ stays in the province.

When separating domestic from foreign tourism, we observe that the tourism multiplier of foreign visitors leaves a higher regional return than does that of domestic visitors. For example, the foreign tourism multiplier in the SAM-based model (model 4) is 1.04, which is 4% more than the direct increase in consumption.

From the point of view of local productive development, sectorial analysis and, particularly, the regional spillovers that follow tourism growth, an interesting observation regarding value chains arises. The limited results that the tourism multipliers show in terms of regional impact seem to indicate that there is space for improving these parameters. It would be worth analysing whether the development of local value chains that allow extension of the impact of tourism growth in the region is possible.

5. Social cost–benefit analysis of tourism programme

In this section, we present a hypothetical cost–benefit exercise and use the results obtained from the I-O model as input.[5] The use of cost–benefit analysis for measuring public investment (including tourism infrastructure) has gained momentum lately, and

Table 6. Hypothetical investment cost for obtaining an NPV of zero (millions of USD). Results form the SAM based model.

	Domestic tourism	International tourism	All tourism
Investment Cost	214.1	65.0	279,1
Change in Regional GDP	0,9%	0.3%	1,2%

Source: Author's estimations.

it is common to see it in impact evaluation documents from institutions like the World Bank and the Interamerican Development Bank (Taylor, 2010). After obtaining the results of the simulations, we can perform the cost–benefit analysis.

Following Taylor (2010), we assume an interest rate of 12% for the update of future flows and the calculation of Net Present Value (NPV). We also assume that the investment made has an effect on tourism from the year following its realisation and that this benefit is presented only once and remains constant over time. In other words, the initial increase in the touristic expenditure over the base year remains constant after the first year.

We can suppose that the reason behind the increase of tourism spending comes from a pro-tourism policy: let us imagine a national and world-wide tourism publicity campaign[6] that shows the touristic highlights of Salta developed. Filming the campaign and showcasing it around the globe would have a cost, but it would increase the arrival of tourists (and tourism spending). The application of a cost–benefit analysis requires knowing the characteristics of the future flow of income that the project will generate. Given that our model is static, we assume that the publicity campaign is produced and showcased on period zero and generates, from period one onward, an increase in the amount of arrivals (ergo of tourism spending) that does not decrease with time. In other words, starting from period one, a new fixed amount of arrivals (larger than the one before) is registered. This assumption could be more complex and realistic but it is enough for our example.

Next, we have to choose a variable that will be used as a contrast to the cost invested in the campaign: in this case it will be the regional GDP. Using our I–O model, we can determine how the regional GDP changes after a 10% increase in tourism spending, so that value will be used as the "income". We calculate the amount of investment or a publicity campaign that results in a null NPV (i.e. the flow of visitors' expenditure is not big enough to compensate for the costs involved in creating it).

The results of this exercise are shown in Table 6. As intuition would indicate, an increase in domestic tourism spending of 10% would finance a higher cost of a publicity campaign than would an increase in international tourism.

If domestic tourism alone increased, the campaign should cost 214 million dollars or less for the Net Present Value to be equal or greater than zero. On the other hand, if international tourism alone increased, the campaign development should be cheaper (USD 65 million) for the NPV to be zero. This makes sense: an increase of 10% in domestic tourism supports a bigger GDP growth than does an increase of the same proportion in international tourism, which means that a bigger cost for financing the campaign can be supported.

6. Conclusion

For some regional economies, the money that comes with tourism can represent their main source of income. This implies that understanding how certain policies affect the tourism industry should be in the interest of the policy makers behind these decisions. Carrying on research into tourism at regional level, though, may face a problem: poor or inexistent data. Computable General Equilibrium (CGE) models and input–output (I–O) models are familiar tools in the literature of tourism research, but the development of their main elements, I–O tables and Social Accounting Matrices (SAMs), requires more resources than are available to most regional statistical institutes.

If officially developed I–O tables are not available, then constructing a self-made one can be a solution. Government agencies usually develop these matrices from data recorded in surveys, but easier and cheaper options are available as substitutes for this methodology. Semi-survey and non-survey techniques do not require as many resources as do survey techniques, but they provide trustable and quality results. In the case of non-survey techniques, the Location Quotient (LQ) methodology can be used as the foundation of the construction of the I–O table. The estimations archived by applying LQ techniques can be reinforced later with surveys focused on certain industries or markets under a hybrid approach.

The province of Salta, in northern Argentina, is a good example of the problems that bad data can raise. Despite being one of the main tourist destinations in the country, with increasing numbers of visitors each year, the lack of an I–O table could be a potential problem for understanding how the growth of the tourism industry is changing this regional economy.

In this study, we constructed an I–O table and a SAM for the province of Salta, using a hybrid approach. The application of this methodology was based on the combined use of Flegg LQs and regional surveys that collected data from households, tourism-related industries, and tourists. We are not aware of hybrid techniques having been used in published studies for the purpose of understanding tourism. The estimated results were then imputed in an I–O model, where an increase in tourism spending was simulated under different scenarios. An example of how these results can be used for cost–benefit analysis has also been presented. By applying the I–O model, we found that an expansion in tourism is correlated with regional GDP and wealth growth. Nevertheless, it seems that an improvement in local value chains could allow Salta's economy to take more advantage of its tourism industry.

Understanding how either policies or events affect the economy is a matter of interest for both policy makers and researchers. CGE and I-O models are a well-known and useful tool for approaching these questions, but SAMs and I–O tables are not usually available at the regional level. Despite this problem, their implementation should not be discouraged, as techniques for estimating new SAMs without the need for expensive and resource-intensive surveys both exist and are available.

Notes

1. The Argentine Republic is composed of 23 provinces and one autonomous city.
2. Domestic visits were estimated using the Domestic Tourism Survey (Ministry of Tourism of Argentina). International visits were estimated using both the national hotel survey and the local hotel survey (INDEC and Ministry of Tourism of Salta, respectively).
3. The survey covers seven cities of a total of five provinces.
4. They found that FLQ performs better for the region with delta near 0.1.

5. This analysis is inspired by an strategy used in a study developed for the Interamerican Development Bank which objective was to evaluate the development of sustainable tourism in the province of Salta (Program of Sustainable Tourism Development in the Province of Salta).
6. The analysis presented here is hypothetical and simple. Certainly, at the time of evaluating the financial aspects of a particular policy, the analyst should consider several aspects of the investment itself. In this particular case, for example, we are ignoring elements such as the effectiveness ratios of marketing expenditure.
7. Salta tourism data were obtained from surveys of households, tourists, and firms from this sector that were carried out at different times to capture seasonality. These surveys were carried out within the framework of the project "Development of Simulation Models for the Monitoring and Evaluation of the Economic Impacts of the Program for Sustainable Tourism Development of the Province of Salta" (IDB loan No. 2835 / OC-AR).

Acknowelegement

We are grateful to IDB and MCyT of Salta and specially to Mrs. Ana Cornejo and Mr. Ricardo Quiroga for crucial help throughout this study. We also thank the Minister of Culture and Tourism of the Province of Salta and Inter-American Development Bank for allowing us to use data collected during the Project Development of simulation models for the Monitoring and Evaluation of the Economic Impacts of the Program "Sustainable Tourism Development of the Province of Salta" (IDB loan No. 2835 / OC-AR). Finally, the support of Camila Sachella, Diego Born, Sergio Passamonti, Gustavo Vega and Gonzalo Sereno were very important in the process of designing, building and processing different households and production surveys. Author(s) are responsible for the arguments, ideas and/or opinions expressed, and they do not symbolize the official opinion of the MCyT of Salta or any office under the IDB.

Disclosure statement

No potential conflict of interest was reported by the authors.

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